



Forest Service  
U.S. DEPARTMENT OF AGRICULTURE



## Rocky Mountain Research Station Science You Can Use *(in 5 minutes)*

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### Compounding Effects of Wildfire and Forest Management on Canada Lynx: the Importance of Management Mosaics

In subalpine forests of the western United States, wildfires are becoming more frequent, severe, and widespread. In response, land management agencies are intensifying their efforts to reduce fire risk and severity, mitigate economic losses, and restore burned areas. These efforts, which include prefire tree removal, and postfire clearcutting, salvage logging, and planting, have varying impacts on wildlife. Sensitive species like fisher, spotted owl, and Canada lynx depend on structurally complex mature forests, and their habitats are often disturbed by forest management and by wildfire. To balance the need for improved forest resilience with the need to conserve sensitive species, land managers must understand the combined effects of wildfire and forest management on forest-dwelling wildlife.

Recent work by Rocky Mountain Research Station scientists and colleagues examined the compound effects of wildfire and forest management on Canada lynx (*Lynx canadensis*), a federally threatened

*Canada lynx wearing a GPS tracking collar. The study included a GPS dataset from a long-term lynx monitoring study that coauthor John Squires has led since 1997. Image modified from a photo by Steve Sunday.*

carnivore. Lynx occupy subalpine forests with large trees, dense cover, and structurally diverse vegetation that support their primary prey species, the snowshoe hare (*Lepus americanus*). Such forests are becoming increasingly impacted by wildfires and experience many types of forest management. As project lead Lucretia Olson stated, “There’s a big push to reduce fuels and mitigate the severity and extent of fires; the question is are we improving or degrading habitat for lynx?” To answer this question, the researchers combined data from multiple independent studies and long-term datasets on forest management actions, wildfire size and severity, snowshoe hare occupancy, and lynx habitat use.

No single forest management strategy fully supported lynx habitat use after wildfires; different strategies led to varying degrees of habitat suitability along different

#### KEY MANAGEMENT CONSIDERATIONS

- No single forest management strategy fully supports lynx habitat use. To best support lynx populations and their habitats, maintaining a mosaic of forest stands that are actively and passively managed, and in different age classes, is key.
- Areas with prefire forest management burned less severely than areas without prefire management. Lynx used prefire managed areas more quickly after a wildfire, but by the end of the study, lynx used both types of areas at similar intensities. Lynx used areas with postfire forest management very infrequently for 10 years after wildfire and management intervention, but by ~25 years after, lynx use peaked, reaching the highest levels seen in the study.
- The benefits of forest management can occur long after implementation; in some cases, up to 25 years later, potentially spanning the course of a land manager’s career.



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timeframes. Prefire management tended to reduce the intensity of wildfires, and lynx used these areas at low to moderate levels starting immediately after fire and continuing for the next 25 years. By contrast, lynx hardly used areas that experienced postfire management for the first 10 years after fire, but by 25 years, they were present at the highest levels seen in the study. Perhaps surprisingly, postfire management includes regeneration cutting, or clearcutting, which can severely impact forest habitat. The pattern of high lynx use in these areas is likely driven by snowshoe hare abundance, which increased in response to the regeneration of forest cover.

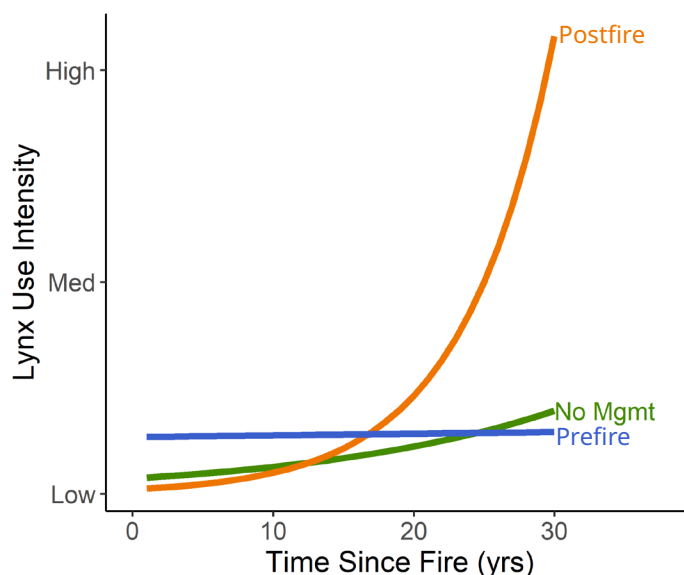
Olson emphasizes, “The main finding that comes out of this, is the importance of mosaics.” To provide favorable habitat for lynx over both the short and long term, land managers could maintain a variety of wildfire management strategies across the landscape, including prefire and postfire management—as well as some unmanaged areas—“so that [lynx] can move from stand to stand as time passes.” Importantly, this research also shows that forest management, fuel reduction, and lynx habitat conservation are not mutually exclusive. John Squires, a Research Wildlife Biologist with the Wildlife and Terrestrial Ecosystems Program of the Rocky Mountain Research Station states, “There is a role of active forest management in ways that ameliorate disturbance to help lynx ... that’s the mosaic.”

## FEATURED SCIENTISTS

**Lucretia Olson** is an Ecologist with the Wildlife and Terrestrial Ecosystems Program of the Rocky Mountain Research Station. Her research focuses on understanding the patterns and processes behind the distribution of animals across a landscape.

**Justin Crotteau** is a Research Forester with the Forest and Woodland Ecosystems Program of the Rocky Mountain Research Station. His research focuses on forest structural and compositional change (i.e., stand dynamics) to inform management.

**John Squires** is a Research Wildlife Biologist with the Wildlife and Terrestrial Ecosystems Program of the Rocky Mountain Research Station. His research focuses on how sensitive forest carnivores and birds of prey in prairie ecosystems respond to increased natural and human-caused disturbance.



*Winter lynx use in managed and unmanaged forests. Lynx use intensity varies with the timing of forest management (pre- or postfire) and the time since fire, demonstrating the value of a landscape mosaic of varied management types across time and space. Adapted from Olson et al. 2023.*

## FURTHER READING

Crotteau, J.S.; Keyes, C.R.; Hood, S.M.; Larson, A.J. 2020. [Vegetation dynamics following compound disturbance in a dry pine forest: fuel treatment then bark beetle outbreak](#). *Ecological Applications*. 30(2): p.e02023.

Holbrook, J.D.; Squires, J.R.; Graham, R.; Olson, L.E.; Jackson, S.; Savage, S.L.; Hanvey, G.; Bollenbacher, B.; Lawrence, R.L. 2019. [Management of forests and forest carnivores: relating landscape mosaics to habitat quality of Canada lynx at their range periphery](#). *Forest Ecology and Management*. 437: 411–425.

Olson, L.E.; Crotteau, J.S.; Fox, S.; Hanvey, G.; Holbrook, J.D.; Jackson, S.; Squires, J.R. 2023. [Effects of compound disturbance on Canada lynx and snowshoe hare: wildfire and forest management influence timing and intensity of use](#). *Forest Ecology and Management*. 530: 120757.

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